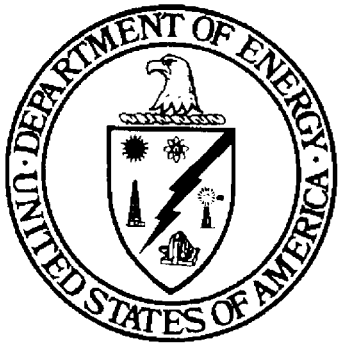
DOE/OR/21548-789
CONTRACT NO. DE-AC05-86OR21548

CLOSEOUT REPORT FOR VICINITY PROPERTIES MDC 3, MDC 4, MDC 5, AND MDC 10

WELDON SPRING SITE REMEDIAL ACTION PROJECT
WELDON SPRING, MISSOURI

JUNE 1999 **REV. 1**



U.S. Department of Energy
Oak Ridge Operations Office
Weldon Spring Site Remedial Action Project

Prepared by MK-Ferguson Company and Jacobs Engineering Group

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MORRISON KNUDSEN CORPORATION MK-FERGUSON GROUP Weldon Spring Site Remedial Action Project Contract No. DE-AC05-86OR21548	
	Rev. No. 1
PLAN TITLE: Closeout Report for Vicinity Properties MDC 3, MDC 4, MDC 5, and MDC 10	

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DOE/OR/21548-789

Weldon Spring Site Remedial Action Project

Closeout Report for Vicinity Properties MDC3, MDC4, MDC5, and MDC10

Revision 1

June 1999

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for the

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ABSTRACT

The closeout report for vicinity properties MDC 3, MDC 4, MDC 5, and MDC 10 summarizes the numerous activities involved in the remediation of each respective property. All vicinity properties are located on Missouri Department of Conservation property and were contaminated as a result of past U.S. Atomic Energy Commission activities. Pre-remediation chemical and radiological characterizations, remedial construction, and clean-up verification activities are detailed within this report.

SUMMARY OF CHANGES

The last sentences in Section 3.1 and Section 3.4 were changed to state that the area had satisfied the Record of Decision cleanup criteria for unrestricted release and was backfilled with a specified amount of clean common fill.

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1. INTRODUCTION

1.1 Purpose

This closeout report has been prepared to document remedial actions within Missouri Department of Conservation (MDC) properties 3, 4, 5, and 10 (MDC 3, MDC 4, MDC 5, and MDC 10). All locations are on Missouri Department of Conservation property and are located near the Weldon Spring Chemical Plant.

1.2 Scope

A closeout report for each vicinity property or grouping of vicinity properties will be prepared following remedial activities. These closeout reports will be included in the remedial action report for the Weldon Spring Chemical Plant Operable Unit, which will be prepared in accordance with *Comprehensive Environmental Response, Compensation and Liability Act of 1980* (CERCLA) requirements. A final site closeout report will also be prepared to complete deletion of the Weldon Spring Site from the National Priorities Listing.

1.3 Background

Vicinity property MDC 3 was located north of the Weldon Spring Site and south of Highway D at the 7,462.1 m (24,466 ft) reference marker (Figure 1-1). It consisted of two small isolated circular areas of contamination (3A and 3B). The area noted as 3A was approximately 9 m^2 in size and area 3B was approximately 4 m^2 in size. There were no obvious features that indicated the reason for contamination. Engineering characterization would later show more than two contaminated areas.

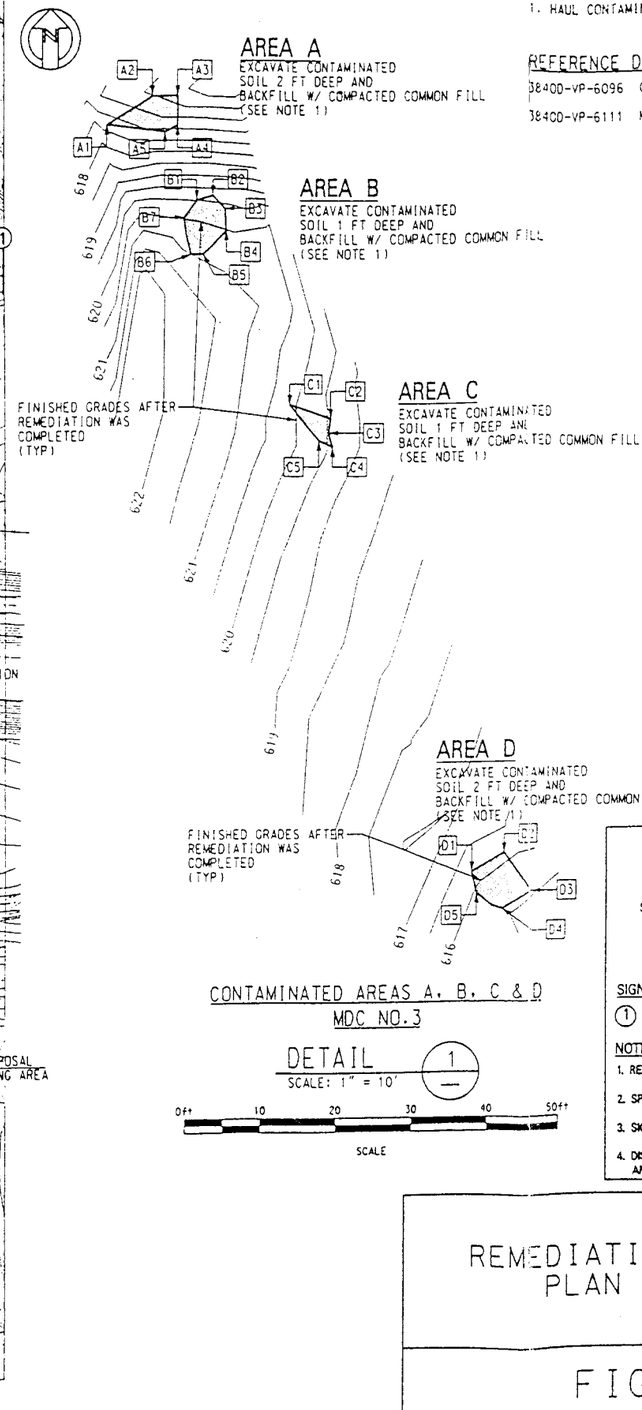
Vicinity property MDC 4 was located south of the Department of Army perimeter fence near an access road (Road C) leading to a radio tower (Figure 1-2). The area consisted of several mounds of soil, wood, metal, and trash debris. This buried debris is the probable cause of the contamination. The property was broken down into one primary area of contamination (Location 4C) and two isolated hot spots (Locations 4A and 4B).

Vicinity property MDC 5 was located southeast of the Weldon Spring site 471 m from the intersection of Highway 94 and a gravel road/hiking trail (Figure 1-3). Contamination was in a drainageway along the eroded gravel road and was a result of three abandoned 55-gallon drums with elevated gamma radiation readings. The contents of the drums were unknown at the time of discovery and later were determined to be drummed raffinate sludge. Several pieces of scrap metal, debris, and deteriorated drums were also discarded along this roadway, however, they were not radiologically contaminated.

SITE PLAN

0ft 50 100 200 300 400ft

SCALE



CONTAMINATED AREAS A, B, C & D
MDC NO. 3

DETAIL 1

SCALE: 1" = 10'

0ft 10 20 30 40 50ft

SCALE

NOTES

1. HAUL CONTAMINATED SOIL TO THE ASH POND DISPOSAL SITE.

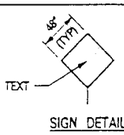
REFERENCE DRAWINGS

38400-VP-6096 GENERAL LEGEND, ABBREVIATIONS & DRAWING LIST

38400-VP-6111 MISCELLANEOUS SECTIONS AND DETAILS (SHEET 3 OF 3)

COORDINATE TABLE

POINT	NORTHING	EASTING
A1	1,045,376.44	754,083.09
A2	1,045,380.18	754,089.06
A3	1,045,380.26	754,092.33
A4	1,045,376.41	754,092.35
A5	1,045,375.53	754,090.61
B1	1,045,366.74	754,094.71
B2	1,045,367.36	754,096.86
B3	1,045,365.71	754,098.42
B4	1,045,362.80	754,098.60
B5	1,045,359.78	754,095.67
B6	1,045,359.72	754,093.95
B7	1,045,364.51	754,093.02
C1	1,045,340.29	754,107.11
C2	1,045,338.46	754,112.62
C3	1,045,336.58	754,112.33
C4	1,045,334.76	754,112.84
C5	1,045,335.58	754,110.96
D1	1,045,279.05	754,131.54
D2	1,045,281.50	754,135.99
D3	1,045,276.45	754,139.81
D4	1,045,274.21	754,135.74
D5	1,045,276.24	754,132.23



SIGN DETAIL

SIGN DESIGNATIONS FOR MDC NO. 5

(1) "SHOULDER WORK AHEAD"

NOTES

1. REMOVE OR LAY DOWN SIGNS WHEN WORK IS NOT IN PROGRESS.
2. SPEED LIMIT IN AREA IS 55 MPH.
3. SIGNS AND MOUNTING TRIPOD PROVIDED BY CONTRACTOR.
4. DISTANCE FROM MDC NO. 3 TO INTERSECTION OF HIGHWAY 94 AND ROUTE "D" IS APPROXIMATELY 2 MILES.

REMEDIATION OF MDC NO. 3 PLAN AND DETAILS

FIGURE 1-1

REPORT NO.: DOE/OR/21548-789		EXHIBIT NO.: B/VP/008/0599	
ORIGINATOR: EMR	DRAWN BY: GLN	DATE: 5/27/99	

NOTES

REFERENCE DRAWINGS

38400-VP-5108 EXCAVATION PLAN FOR VICINITY PROPERTY MDC 4

GRAPHIC SCALE

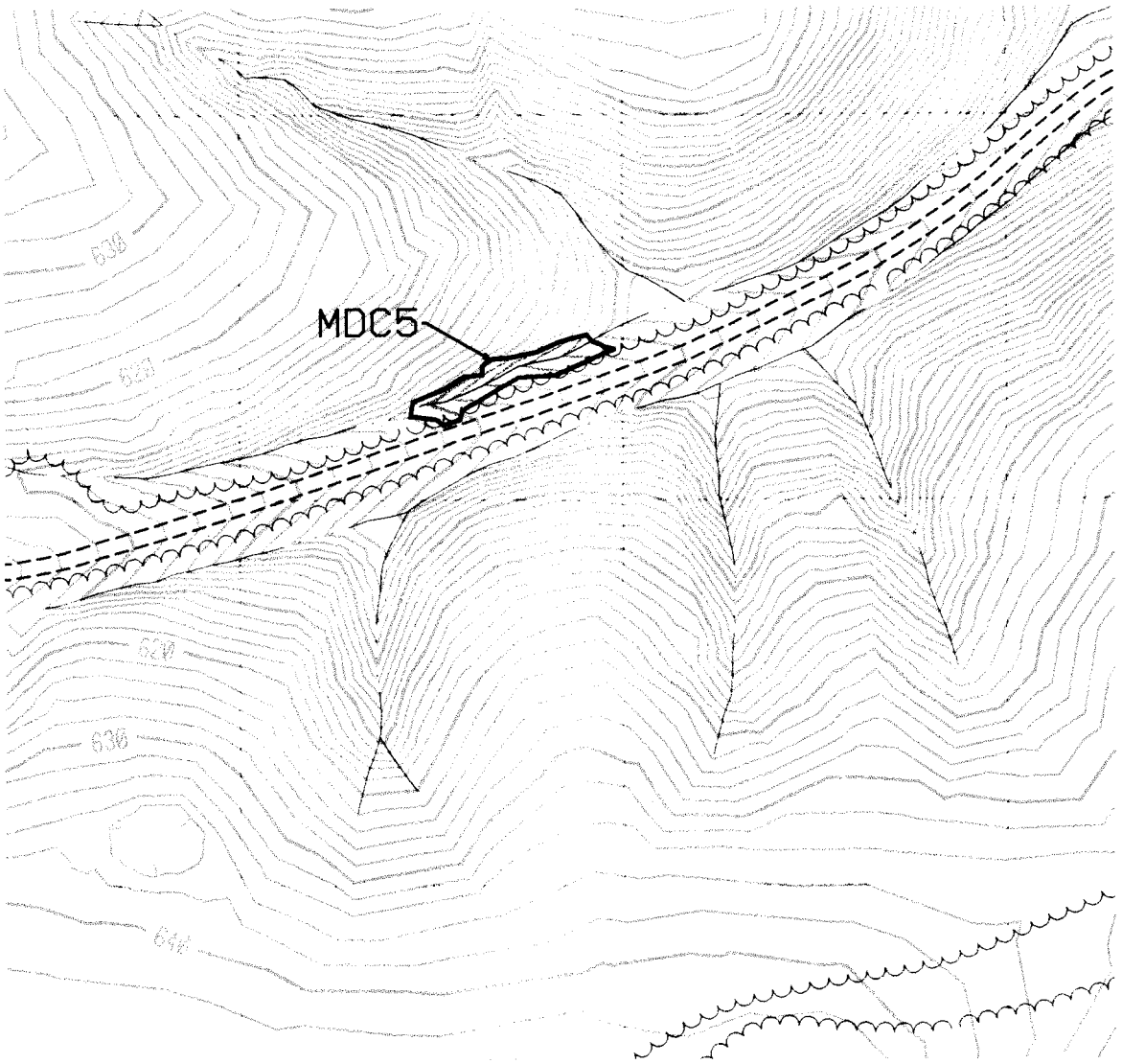
0ft 10 20 40 80 120ft

SCALE

EXISTING SITE PLAN VICINITY PROPERTY MDC 4

FIGURE 1-2

REPORT NO.: DOE/OR/21548-789		EXHIBIT NO.: B/VP/009/0599	
ORIGINATOR: EMR	DRAWN BY: GLN	DATE: 5/27/99	



LEGEND

EXISTING ROAD

WATERLINE

TREELINE

LOCATION OF MDC-5 AND SURROUNDING FEATURES

FIGURE 1-3

REPORT NO.:	DOE/OR/21548-789	EXHIBIT NO.:	G/CP/206/0599		
ORIGINATOR:	EMR	DRAWN BY:	LGB	DATE:	05/12/99

Vicinity property MDC 10 was located north of Highway D adjacent to an access road leading to Busch Wildlife Area Lake 21 (Figure 1-4). The area was identified as Army Disposal Area 2. Initially, two very small isolated locations of elevated radiation were discovered. Follow-up investigations revealed additional contaminated material within the property.

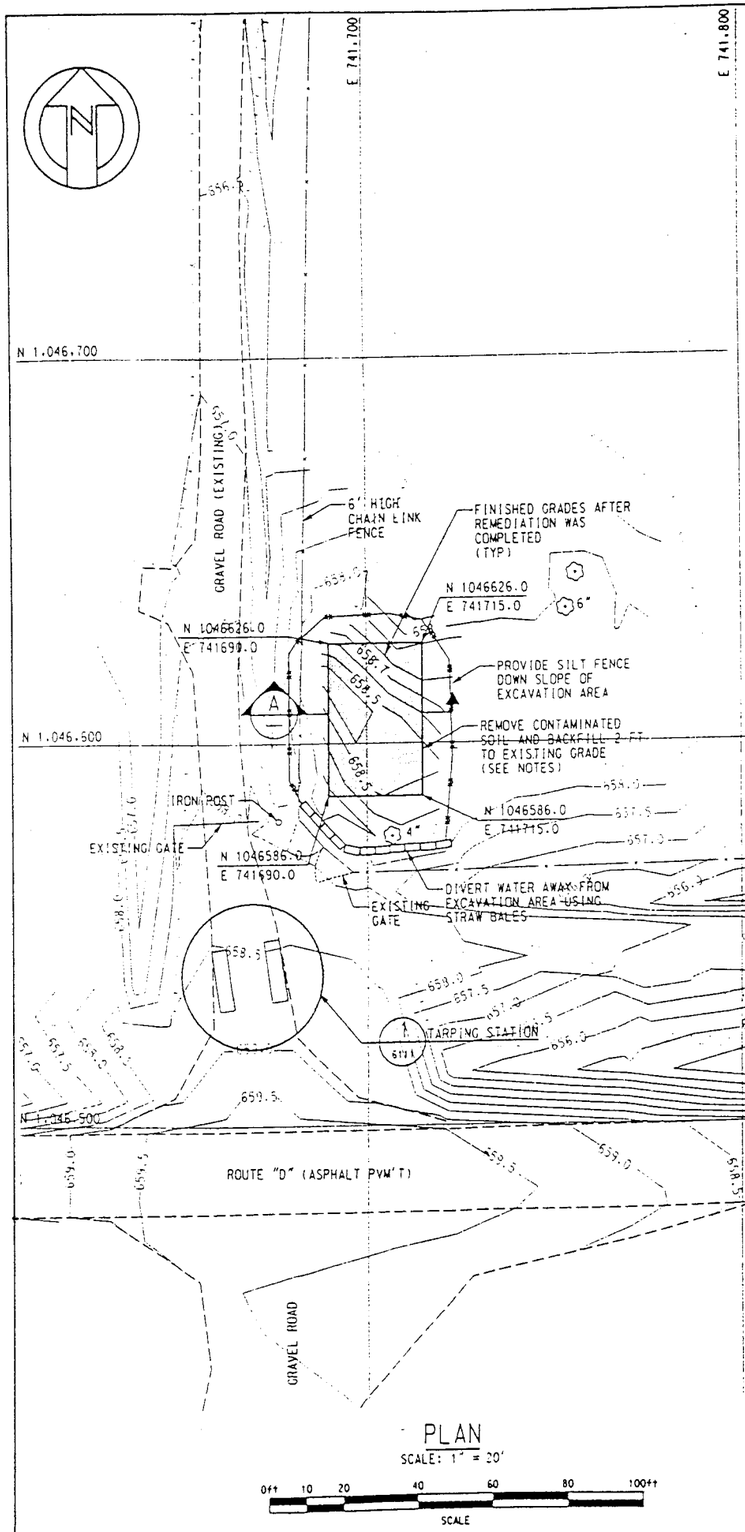
1.4 Vicinity Property Description

In 1985, Oak Ridge Associated Universities (ORAU) conducted a comprehensive radiological survey of all areas outside the chemical plant boundary and within the boundary of the previous ordnance works area (Ref. 1 and Ref. 2). The purpose of the study was to assess the extent and levels of off-site radiological contamination resulting from the operation of the uranium feed materials plant. The study examined surface and subsurface soils, water, and sediment on the properties adjacent to the site. Because of the nature of the wildlife areas, it was DOE's and ORAU's intention to avoid any unnecessary disturbance or damage to surface features. Consequently, there were no general site clearing and gridding preparations. Instead, measurement and sampling locations were referenced to existing surface features. Results of these initial surveys were used to determine if more detailed characterization was required.

Backround levels and baseline concentrations were taken of each matrix within the vicinity of the area. These levels/concentrations were used to determine the extent of radiological contamination within a surveyed area. ORAU used the following concentrations to determine radioactively contaminated soil:

Ra-226 and Th-232	5 pCi/g averaged over the first 6 in. of soil depth 15 pCi/g if greater than 6 in. deep
U-238	60 pCi/g averaged over the suspect area.

The results of the study revealed soils at several small locations on the U.S. Department of Army Ordnance Works Area and the Missouri Department of Conservation areas contained generally low levels of radioactivity as a result of previous site activities. In total, ORAU identified 17 vicinity properties, seven of which were located on the Weldon Spring Training Area and ten of which were located on the Missouri Department of Conservation wildlife areas. This closure report identifies four of the MDC vicinity properties and these are identified in relationship to the Weldon Spring site in Figure 1-5.

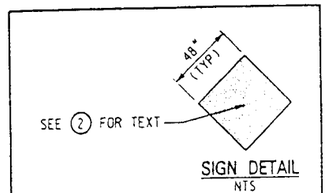


PLAN

SCALE: 1" = 20'

0ft 10 20 40 60 80 100ft

SCALE



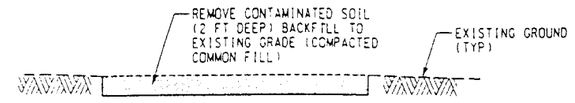
SIGN DETAIL

NTS

SIGN DESIGNATIONS FOR MDC 10

(2) "CAUTION TRUCKS LEAVING AND ENTERING HIGHWAY"

SEE NOTES 4, 5 & 6 FOR FURTHER DETAILS



SECTION A

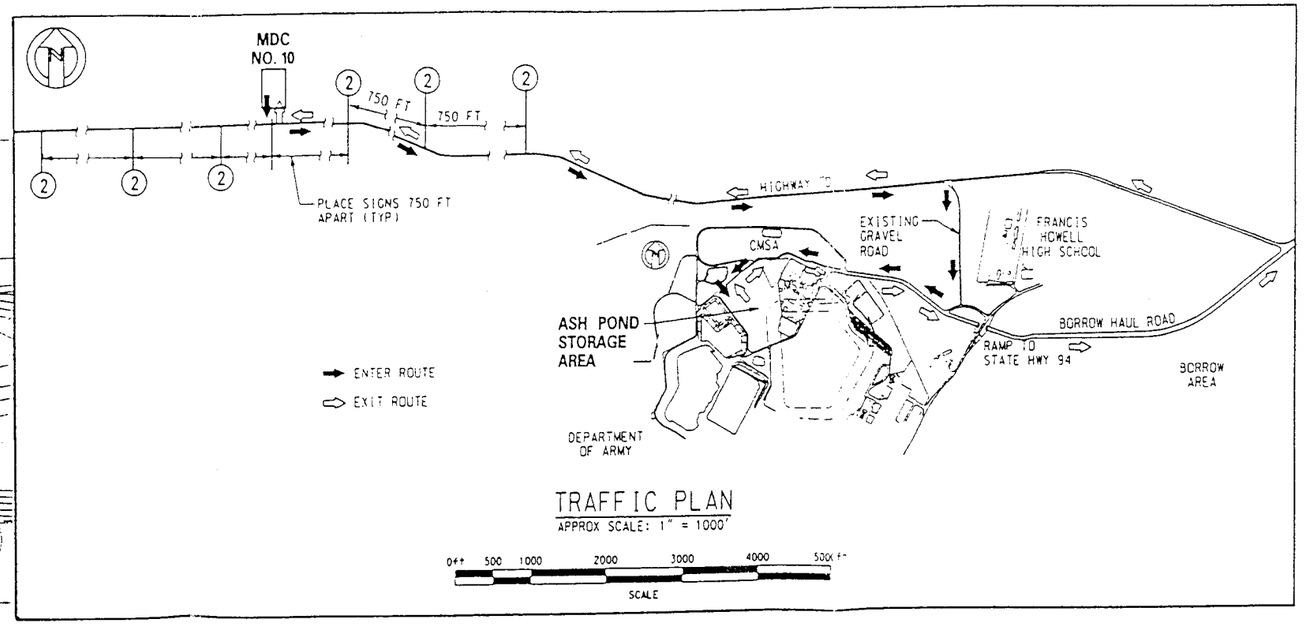
NTS

NOTES

1. AREA SHALL BE EXCAVATED FROM UPSTREAM TO DOWNSTREAM. PRIOR TO EXCAVATION INSTALL DRAINAGE CONTROLS, AND NOTIFY CONTRACTOR FOR APPROVAL OF PROPER INSTALLATION.
2. EXCAVATION WILL BE CONFIRMED CLEAN BY CONTRACTOR (MAXIMUM 5 DAY CONFIRMATION PERIOD). AFTER CONFIRMATION BACKFILL TO EXISTING GRADE. SEED AND MULCH ALL DISTURBED AREAS, IN ACCORDANCE WITH SPECIFICATION 02200.
3. DRAINAGE CONTROL FEATURES SHALL NOT BE REMOVED UNTIL VEGETATION IS REESTABLISHED IN ALL DISTURBED AREAS THAT HAVE BEEN SEEDED.
4. REMOVE OR LAY DOWN SIGNS WHEN WORK IS NOT IN PROGRESS.
5. SPEED LIMIT IN AREA IS 55 MPH.
6. SIGNS AND MOUNTING TRIPOD PROVIDED BY CONTRACTOR.
7. DISTANCE FOR THE INTERSECTION OF HIGHWAY 94 AND ROUTE D IS APPROXIMATELY 3.25 MILES.

REFERENCE DRAWINGS

38-00-VP-6096 GENERAL LEGEND, ABBREVIATIONS & DRAWING LIST
38-00-VP-6111 MISCELLANEOUS SECTIONS AND DETAILS (SHEET 3 OF 3)



TRAFFIC PLAN

APPROX SCALE: 1" = 1000'

0ft 500 1000 2000 3000 4000 5000 ft

SCALE

REMEDIATION OF MDC NO. 10 PLAN AND SECTION

FIGURE 1-4

REPORT NO.: DOE/OR/21548-789	EXHIBIT NO.: B/VP/010/0599	
ORIGINATOR: EMR	DRAWN BY: GLN	DATE: 5/27/99

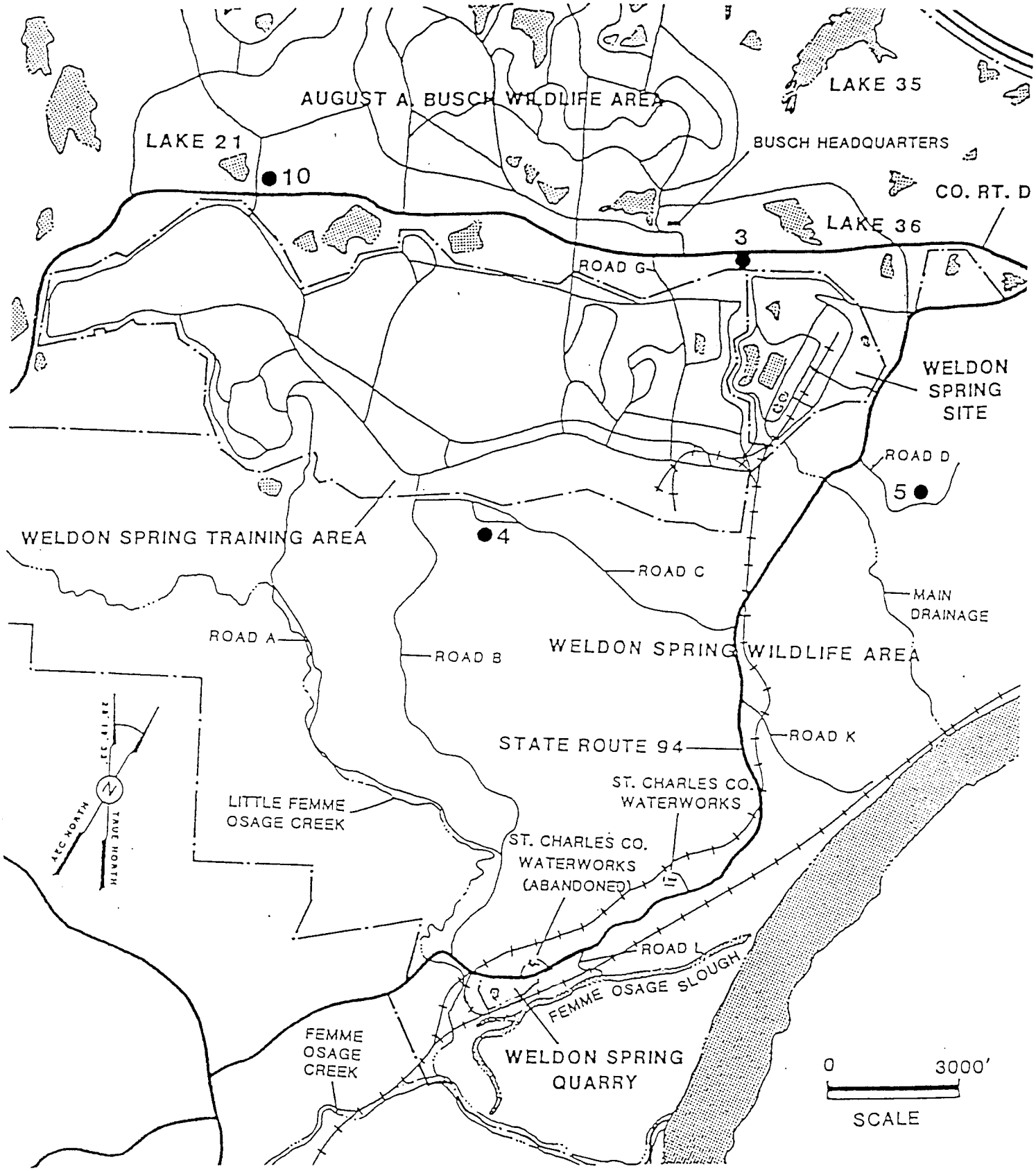


Figure 1-5
ORAU IDENTIFIED LOCATIONS OF CONTAMINATED MISSOURI DEPARTMENT OF CONSERVATION (MDC) PROPERTIES
REPORT NO.: DOE/OR/21548-789

1.5 CERCLA Summary

The *Record of Decision* (ROD) *for Remedial Action at the Chemical Plant Area of the Weldon Spring Site* is a remedial action decision document written in accordance with the *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA) (Ref. 3). It was established for the Chemical Plant Area Operable Unit and addresses selected remedial actions for various sources of contamination at the chemical plant and off-site vicinity properties. Remedial actions established within the ROD for vicinity properties involve soil removal and on-site disposal within a facility designed and constructed specifically for the Weldon Spring site wastes. The ROD was signed by the DOE on September 13, 1993, and by the Environmental Protection Agency (EPA) on September 28, 1993.

Cleanup criteria for soils within the ROD were developed from the results of the site-specific risk assessment for a residential scenario Additionally, as low as reasonably achievable (ALARA) criteria were developed to represent lower levels that the remedial actions would aim to achieve during field excavation activities. Cleanup criteria and ALARA values are applicable to surface soils (0 in. to 6 in.) or subsurface soils (greater than 6 in.). Radiological and chemical contaminants of concern for the chemical plant area are defined in the ROD and listed in Table 1-1. Soils excavated from the vicinity properties were transported to the chemical plant area for temporary storage and final on-site disposal in the engineered disposal facility being constructed in accordance with the ROD.

Table 1-1 Radionuclide and Chemical Contaminant Soil Cleanup Criteria

	SURFACE		SUBSURFACE	
Radionuclide (pCi/g)	**ALARA**	**Criteria**	**ALARA**	**Criteria**
Radium-226	5.0	6.2	5.0	16.2
Radium-228	5.0	6.2	5.0	16.2
Thorium-230	5.0	6.2	5.0	16.2
Thorium-232	5.0	6.2	5.0	16.2
Uranium-238	30.0	120	30	120
Chemical (mg/kg)				
Arsenic	45	75	75	750
Chromium (total)	90	110	110	1,110
Chromium (VI)	90	100	100	1,000
Lead	240	450	450	4,500
Thallium	16	20	20	200
PAHs	0.44	5.6	5.6	56
PCBs	0.65	8	8	80
TNT	14	140	140	1,400

2. PRE-REMEDIATION ACTIVITIES

2.1 Oak Ridge Associated Universities Survey

As stated previously, initial soil characterization for properties MDC 3, MDC 4, MDC 5, and MDC 10 was conducted by Oak Ridge Associated Universities (ORAU) during July 1984 through September 1985. During the survey, surface beta measurements, surface gamma measurements, surface and subsurface soil samples, water samples, and sediment samples were collected. Tabe 2-1 summarized the ORAU data for the MDC 3, 4, 5, and 10 soil (both surface and subsurface).

Table 2-1 ORAU Summary for Surface and Subsurface Soil

Vicinity Property	Ra-226 Concentration Range (pCi/g)	Th-232 Concentration Range (pCi/g)	U-238 Concentration Range (pCi/g)	Primary Contaminant	Estimated Volume (yd^3)
MDC 3	0.66 – 1.78	1.11 – 2.06	19.8 – 3020.0	U-238	17
MDC 4	0.53 – 430.0	< 0.15 – 1.59	0.39 – 80.9	Ra-226 & U-238	490.5
MDC 5	0.89 – 3.12	0.58 – 1.13	< 0.49 – 2.79	Unknown	< 0.65
MDC 10	0.38 – 8.53	< 0.09 – 28.7	< 0.37 – 38.1	Unknown	*

* ORAU reported that sampling within this area was effective in removing the contaminants and no further action was required.

2.2 PMC Remedial Investigation of the Chemical Plant Area

Using the ORAU data as a guide, the PMC resurveyed vicinity property locations MDC 3, MDC 4, MDC 5, and MDC 10 in October of 1987 and May of 1989. The purpose of resurveying the areas was to determine the appropriate remedial effort necessary to clean up the individual locations. The ORAU survey results provided valuable information concerning the concentrations of radionuclides and the locations of the contamination. However, this survey did not allow an estimation of the depths of contamination across the areas of concern. The second survey was performed in order to determine the effort needed to remove the radiological contaminants associated with the former uranium processing plant from the vicinity properties.

To define the horizontal extent of contamination, the ORAU grid systems were reproduced on the properties. At Weldon Spring Site Remedial Action Project (WSSRAP) soil sample locations, gross gamma radiation count rates were measured with a Ludlum Model 2220 scaler. Within each contaminated region defined by ORAU, soil samples were collected to confirm the radionuclide constituents.

To estimate the depth of contamination at each location, soil samples were collected using a hand-auger sampling tool. Sampling was performed in 6-in. increments until a predetermined background gross gamma count rate was observed at the bottom of the sampling hole.

2.2.1 MDC 3

PMC personnel surveyed MDC 3 in October of 1987. There was a discrepancy between the boundaries of the two contaminated areas reported by the ORAU and PMC remedial investigation (RI) studies. The PMC found the larger area of contamination (3A) was closer to the road and the smaller area was several feet to the south. ORAU reported the reverse of this. It was suspected that the contamination boundaries were mistakenly switched on a map provided in the ORAU report. The PMC data was used to estimate excavation quantities. Radiological characterization of MDC 3 consisted of Ra-226, Ra-228, Th-232, and U-238. No chemical characterization was performed. Results of this characterization activity are summarized in both the *Remedial Investigation for the Chemical Plant Area of the Weldon Spring Site* (Ref. 4) and the *Characterization Report IRA 5 August A. Busch and Weldon Spring Wildlife Area Vicinity Properties 3, 4, 5, and 8* (Ref. 5).

To delineate the horizontal boundary of contamination at Location 3A, the PMC measured gross gamma radiation levels on the surface of the ground in 1-ft increments from the approximate center of the contaminated area in four directions. Measurements continued until a background reading was obtained with the scintillation detector. The results indicated a contaminated area that was 9 ft by 8 ft in the north-south direction and 8 ft in the east-west directions. Radionuclide concentrations from soil samples contained elevated levels of U-238. PMC results for Ra-226 and Th-232 were at background levels.

There was also a discrepancy between subsurface soil information in the ORAU and PMC RI studies. Subsurface soil samples collected by ORAU indicated contamination to a depth greater than 3 ft. The PMC collected soil samples to a depth of 1.5 ft where results indicated contamination to a depth of 1 ft. Since the PMC could not locate any contamination deeper than 1 ft, it was decided to use the PMC data to estimate contaminated volumes. The quantity of contaminated material was estimated to be 3 cu yd with an average U-238 concentration of 161 pCi/g.

To define the horizontal boundary of contamination at Location 3B, the PMC measured gross gamma radiation levels on ground surface using the same procedure as for Location 3A. The results indicated a contaminated area 7 ft in the north-south direction and 6 ft in the east-west directions. Radionuclide concentrations in soil samples collected within 3B also contained elevated levels of U-238. PMC results for Ra-226 and Th-232 were at background levels. The estimated quantity of contaminated material within 3B was approximately 7 cu yd with an

average U-238 concentration of 228 pCi/g. Soil sample results of 3B in addition to location 3A are summarized in Table 2.2-1. Bolded areas in Table 2-2 represent concentrations either above ROD ALARA levels or above both ALARA and cleanup criteria levels.

Table 2-2 Radionuclide Concentrations in MDC3 Soil Samples

Location	Depth (inches)	Ra-226 (pCi/g)	Th-232 (pCi/g)	U-238 (pCi/g)
Area 3A	0 –6	1.0	< 0.6	**288.9**
	6 – 12	1.0	1.1	**33.4**
	12 – 18	1.1	1.2	14.1
Area 3B	0 – 6	< 0.6	< 0.8	**1004.3**
	6 – 12	1.2	< 0.6	**105.9**
	12 – 18	1.1	1.0	**119.4**
	18 – 24	0.8	0.7	**93.2**
	24 – 30	1.1	< 0.6	**137.2**
	30 – 36	< 0.9	< 1.4	**51.4**
	36 – 42	0.8	< 0.6	**84.9**

2.2.2 MDC 4

PMC personnel resurveyed MDC 4 in October 1987. ORAU had originally identified three contaminated areas (Locations 4A, 4B, and 4C). At Location 4A, the contamination was associated with a mound of white, powder-like material (possibly gypsum) covered with soil. The mound measured 21 ft in the north-south direction and 8 ft in the east-west direction. Radionuclide concentrations in soil samples collected at this location contained elevated levels of Ra-226 and U-238. PMC sample results determined the depth of contamination to be approximately 1.5 ft. The quantity of contaminated material was estimated to be 9 cu yd with an average Ra-226 concentration of 23 pCi/g and U-238 concentration of 15 pCi/g.

At Location 4B, the contamination was associated with a spill of black cylindrical material (possibly graphite). The spill area measured 26 ft in the north-south direction and 5 ft in the east-west direction. A surface soil sample was collected by the PMC and the analytical results indicated radionuclide concentrations at background concentrations. Thus, the contamination was assumed to be confined to the spilled material. The debris was confined to the surface (6 in.); therefore, the estimated volume of material was approximately 2 cu yd.

At Location 4C, the contamination was associated with a gravel area adjacent to a secondary road. The area measured 66 ft in the north-south direction and 98 ft in the east-west direction. Radionuclide concentrations in soil samples collected within this area contained elevated levels of Ra-226 and U-238. The average Ra-226 concentration was 110 pCi/g while

the average U-238 concentration was 16 pCi/g. The analytical data indicated the depth of contamination at 1 ft with an estimated volume of contaminated material to be approximately 240 cu yd. No chemical analysis was run on any of the three locations. Radiological data for all three locations within MDC 4 are summarized in Table 2-3. Bolded areas in Table 2-3 represent concentrations either above ROD ALARA levels or above both ALARA and Cleanup Criteria levels.

Table 2-3 Radionuclide Concentrations in MDC 4 Soil Samples

Location	Depth (inches)	Ra-226 (pCi/g)	Th-230 (pCi/g)	Th-232 (pCi/g)	U-238 (pCi/g)
Area 4A	0 –9	**10.6**	**15.0**[a]	< 0.8	10.0
	9 – 12	**27.5**		< 1.2	24.1
	12 – 18	**32.2**		< 1.2	< 10.0
	18 – 24	**6.2**		< 0.7	5.50
	24 – 27	4.2		< 0.7	< 3.70
Area 4B	0 – 6	1.1		< 0.4	< 2.10
Area 4C	0 – 6	**139.9**	**44.0**[a]	< 1.9	< 14.4
	6 – 12	**96.4**		< 1.5	< 11.0
	12 – 18	**49.4**		< 1.0	< 7.60

(a) Soil sample was a composite sample from all depths at the location.

2.2.3 MDC 5

When PMC personnel resurveyed MDC 5 in October 1987, two additional barrels with elevated gamma radiation readings were discovered adjacent to the original barrel identified in the ORAU survey. A walkover scan of the area indicated that the radioactive material discovered by ORAU was still confined to the abandoned drums. Therefore, no additional characterization samples were taken. The amount of contaminated material to be removed was 1 cu yd based on the volume of three 55-gal drums.

To remediate the location, the PMC excavated the three drums in May of 1988. A dike was built in the drainage to prevent the contamination from spreading. As the drums were being removed, liquid leaked out of holes in the drums. Soil that came in contact with the liquid was excavated until readings were slightly above background levels. The soil was removed and deposited in seventeen 55-gal drums. The three drums of contaminated material were placed in 85-gal overpacks. All drums were placed in Building 434 at the chemical plant site for interim storage.

Immediately following the cleanup, the PMC collected samples in the excavated area. A composite sample of the area revealed elevated concentrations of Ra-226 and Th-230. The following day, ORAU performed an independent verification survey of MDC 5. Soil samples were collected from the excavation and from the undisturbed area around the excavation. Soil samples from within the excavation contained Th-230 concentrations ranging from 400 pCi/g to 3,100 pCi/g. ORAU indicated that there was no evidence of elevated radionuclide concentrations on the surface surrounding the excavation.

In November 1988, the PMC resurveyed MDC 5 to determine if Th-230 contamination, which cannot be detected by in situ gamma measurements, had washed down the drainage. Soil samples were collected in the center of the drainage from 10 feet upstream to 435 ft downstream of the previously excavated area. Samples were collected with a hand-held auger to a depth of 1.5 ft or until auger refusal. Based on the PMC data, the volume of contaminated material was estimated to be approximately 1 cu yd. Analytical data for MDC 5 are summarized in Table 2-4. Bolded areas within Table 2-4 represent concentrations either above ROD ALARA levels or above both ALARA and Cleanup Criteria levels.

Table 2-4 Radionuclide Concentrations in MDC 5 Soil Samples

Location	Depth (inches)	Ra-226 (pCi/g)	Ra-228 (pCi/g)	Th-230 (pCi/g)	U-238 (pCi/g)
10' Uphill of Excavated Area	0" – 6"	1.10	< 0.56	3.90	1.51
10' Uphill of Excavated Area	6" – 12"	1.20	< 0.61	**12.0**	4.50
10' Uphill of Excavated Area	12" – 18"	0.92	< 0.68	2.60	< 0.92
25' Downhill of Excavated Area	0" – 6"	0.87	< 0.58	2.80	< 0.82
25' Downhill of Excavated Area	6" – 12"	0.83	0.83	1.60	0.97
25' Downhill of Excavated Area	12" – 18"	1.25	1.08	3.50	< 1.06
50' Downhill of Excavated Area	0" – 6"	0.72	< 0.61	3.50	4.26
100' Downhill of Excavated Area	0" – 6"	0.69	< 0.57	**8.00**	< 0.81
100' Downhill of Excavated Area	6" – 12"	0.99	1.00	2.10	2.46
100' Downhill of Excavated Area	12" – 18"	1.14	1.17	1.40	< 1.06
130' Downhill of Excavated Area	0" – 6"	1.04	1.70	**110.0**	18.8
130' Downhill of Excavated Area	6" – 12"	1.38	1.19	2.10	2.23
130' Downhill of Excavated Area	12" – 18"	1.24	1.35	1.50	< 1.14
130' Downhill of Excavated Area	18" – 24"	1.17	1.40	1.40	2.54
130' Downhill of Excavated Area	24" – 30"	1.39	2.00	1.30	< 1.07
200' Downhill of Excavated Area	0" – 6"	1.19	< 0.60	1.30	< 1.06
200' Downhill of Excavated Area	6" – 12"	1.60	1.30	2.00	2.00

Table 2-4 Radionuclide Concentrations in MDC 5 Soil Samples (Continued)

Location	Depth (inches)	Ra-226 (pCi/g)	Ra-228 (pCi/g)	Th-230 (pCi/g)	U-238 (pCi/g)
400' Downhill of Excavated Area	0" – 6"	1.13	< 0.80	1.20	2.99
400' Downhill of Excavated Area	6" – 12"	1.06	1.00	2.00	8.25
435' Downhill of Excavated Area	0" – 6"	1.25	1.10	2.90	2.42
435' Downhill of Excavated Area	6" – 12"	1.24	< 1.05	1.60	< 1.55
435' Downhill of Excavated Area	12" – 18"	1.14	< 0.73	1.60	< 0.84
435' Downhill of Excavated Area	18" – 24"	1.13	1.40	1.20	< 0.98

2.2.4 MDC 10

ORAU had reported that sampling two locations within MDC 10 was effective in removing radioactive contaminants and that no further action was required. With this in mind the PMC performed a cursory gamma walkover survey of MDC 10 in June 1989. The survey revealed gamma radioactivity elevated slightly above background. In April 1990, the PMC collected a surface soil sample in the center of the contaminated area. The sample was analyzed for Ra-226, Ra-228, Th-230, and U-238. The results of this analysis revealed a Th-230 concentration of 36 pCi/g. On the basis of this data, the total volume of contaminated material was estimated to be approximately 0.2 cu yd.

2.3 Engineering Characterization of the MDC Properties

Radiological engineering characterization was performed on properties MDC 3, MDC 4, MDC 5, and MDC 10 during 1996 and 1997. The purpose of this characterization was to delineate the lateral and vertical extent of radiological soil contamination requiring excavation in these vicinity properties. Walkover scans using 2x2 sodium iodide (NaI) detectors were performed at the specified vicinity properties. The scans were generally performed on a grid with 20 ft node-to-node spacing and focused on identifying Ra-226, Ra-228, and U-238. In addition to the survey measurements taken on the prescribed sampling grid, the walkovers were used to establish the contamination perimeter at 1.5 times background levels. Specific details of this sampling activity can be found in the *Engineering Soils Sampling Plan for Army and MDC Vicinity Properties* (Ref. 6).

Because the characterization data for the contaminated soils and sediments was an attempt to qualify engineering estimates for soil removal volumes with an accuracy of ±25% of the actual quantity, the number of samples chosen to define the vertical extent of contamination was designed to both attain this accuracy level and be cost effective. Samples were collected at 1-ft depth intervals and analyzed as discrete samples. Ra-228 results were multiplied by a correction factor of 1.025 to determine the estimated Th-232 concentration. Radiological

concentrations that exceeded either ROD ALARA levels or ROD criteria levels are summarized in Table 2-5.

Table 2-5 Engineering Characterization Exceeding ALARA or Criteria Levels

Vicinity Property/ Sample Number	Northing	Easting	Parameter	Concentration (pCi/g)	Comments
MDC 3					
SO-V96004-01-MDC3	1045377.9	754090.9	U-238	165.0	Exceeds Criteria
MDC 4					
SO-V96011-01-MDC4	1038747.5	747448.1	Ra-226	23.4	Exceeds Criteria
SO-V96011-02-MDC4	1038747.5	747448.1	Ra-226	6.21	Exceeds Criteria
MDC 5					
SO-V97021-01-MDC5	1039667.0	757133.1	Th-230	85.1	Exceeds Criteria
SO-V97023-01-MDC5	1039659.9	757122.3	Ra-226	5.24	Exceeds ALARA
SO-V97023-01-MDC5	1039659.9	757122.3	Th-230	77.7	Exceeds Criteria
SO-V97025-01-MDC5	1039656.0	757123.6	Th-230	6.63	Exceeds Criteria
SO-V97028-01-MDC5	1039671.1	757131.9	Th-230	7.97	Exceeds Criteria
SO-V97030-01-MDC5	1039655.3	757117.8	Th-230	14.4	Exceeds Criteria
SO-V97033-01-MDC5	1039653.3	757115.7	Th-230	16.2	Exceeds Criteria
SO-V97034-01-MDC5	1039659.3	757115.3	Th-230	5.18	Exceeds ALARA
SO-V97039-01-MDC5	1039671.8	757137.7	Th-230	6.13	Exceeds ALARA
SO-V97040-01-MDC5	1039654.1	757113.1	Th-230	14.8	Exceeds Criteria
SO-V97042-01-MDC5	1039648.0	757112.5	Th-230	7.57	Exceeds Criteria
SO-V97043-01-MDC5	1039644.9	757112.3	Th-230	15.9	Exceeds Criteria
SO-V97044-01-MDC5	1039650.7	757110.8	Th-230	14.0	Exceeds Criteria
SO-V97046-01-MDC5	1039656.3	757108.7	Th-230	7.28	Exceeds Criteria
SO-V97050-01-MDC5	1039649.7	757105.3	Th-230	11.3	Exceeds Criteria
SO-V97052-01-MDC5	1039666.2	757145.8	Th-230	5.49	Exceeds ALARA
SO-V97053-01-MDC5	1039669.0	757144.3	Th-230	5.65	Exceeds ALARA
SO-V97058-01-MDC5	1039673.1	757152.4	Th-230	11.3	Exceeds Criteria
SO-V97059-01-MDC5	1039670.0	757151.5	Th-230	8.44	Exceeds Criteria
SO-V97060-01-MDC5	1039674.1	757150.5	Th-230	9.16	Exceeds Criteria
SO-V97069-01-MDC5	1039682.0	757177.5	Th-230	8.82	Exceeds Criteria

Table 2-5 Engineering Characterization Exceeding ALARA or Criteria Levels (Continued)

Vicinity Property/ Sample Number	Northing	Easting	Parameter	Concentration (pCi/g)	Comments
MDC 10					
SO-V97009-01-MDC10	1046595.3	741700.5	Th-230	6.41	Exceeds Criteria
SO-V97010-01-MDC10	1046594.8	741705.4	Th-230	5.72	Exceeds ALARA
SO-V97011-01-MDC10	1046594.2	741709.7	Th-230	8.10	Exceeds Criteria
SO-V97013-01-MDC10	1046600.1	741700.1	Th-230	9.60	Exceeds Criteria
SO-V97014-01-MDC10	1046599.8	741705.2	Th-230	15.5	Exceeds Criteria
SO-V97015-01-MDC10	1046599.2	741710.0	Th-230	8.19	Exceeds Criteria
SO-V97022-01-MDC10	1046605.1	741710.2	Th-230	6.26	Exceeds Criteria
SO-V97027-01-MDC10	1046610.1	741705.2	Th-230	31.0	Exceeds Criteria
SO-V97034-01-MDC10	1046620.0	741705.2	Th-230	6.16	Exceeds ALARA

While analyzing the engineering characterization soil samples for the radiological parameters within MDC 5, it was noted that the Th-230 recoveries were poor, possibly due to a chemical interference. A decision was made to screen a portion of the soil samples using the on-site XRF (x-ray fluorescence) for a possible explanation of the poor recoveries. The XRF provides a screening level analyses for arsenic, chromium, lead, and thallium. Results for arsenic and thallium were less than the surface ALARA goals, while chromium and lead results exceeded surface criteria.

Based on the data from this extensive characterization activity, the following contaminated soil volumes of contaminated material were estimated for each Missouri Department of Conservation property and incorporated into work package 458.

Vicinity Property	Estimated Volume
MDC 3	9 cu yd
MDC 4	543 cu yd
MDC 5	122 cu yd
MDC 10	74 cu yd
Total Quantity:	748 cu yd

3. REMEDIAL ACTIVITIES

Remediation of MDC 3, MDC 4, MDC 5, and MDC 10 began on October 26, 1997, and was completed on June 22, 1998. The remediation was performed under work package WP-458. Contaminated soils were transported to the Ash Pond storage area, root balls to the chipped wood storage area, and miscellaneous materials to the material staging area. Temporary access roads leading to and from the vicinity properties were constructed and maintained during the remediation activities. Surface water and erosion control systems were built to prevent uncontaminated water from entering the excavation zone and becoming contaminated. Any area exceeding 1.5 times background activity was excavated until the background activity fell below this criteria. After the contaminated soil within the vicinity property had been excavated, the PMC performed confirmation sampling to verify that the contaminants exceeding ROD cleanup criteria levels had been removed. If contaminants remained above cleanup criteria, the area was further excavated. Otherwise the area was backfilled with clean soil from an approved commercial source.

3.1 MDC 3 Construction Activities

The remediation of MDC 3 began on June 17, 1998, and was completed on June 22, 1998. Perimeter boundaries around the four contaminated areas (A, B, C, & D) within MDC 3 were established. Soil within each area was excavated to the specified depth. If NaI 2x2 walkovers continued to show elevated readings, the subcontractor excavated additional soil. The volume of contaminated material removed from MDC 3 increased from approximately 9 cu yd to 13 cu yd as a result of these NaI 2x2 walkovers. Following that soil removal, soil confirmation samples were collected to ensure that contaminated materials had been removed. Once the area had satisfied the ROD cleanup criteria for unrestricted release, it was backfilled with approximately 13 cu yd of clean common fill and graded to the original elevation.

3.2 MDC 4 Construction Activities

Remediation of MDC 4 began on October 26, 1997, and was completed on November 26, 1997. The volume of contaminated material estimated to be removed from the three contaminated areas within this vicinity property and the actual volume removed was the same, approximately 543 cu yd. Following soil removal, additional walkover surveys were conducted and soil confirmation samples were collected to ensure that contaminated materials had been removed. Once the area had satisfied the ROD cleanup criteria for unrestricted release, it was backfilled with approximately 543 cu yd of clean common fill and graded to the original elevation.

3.3 MDC 5 Construction Activities

Remedial construction activities within MDC 5 began on June 12, 1998, and were completed by June 16, 1998. Sandbag dams were constructed both upstream and downstream of the area to be excavated to control surface water run-on and runoff. A 12-in. diameter corrugated HPDE pipe was placed in front of the upstream dam running under the gravel road so that water could be diverted to the drainageway on the other side of the road. Straw bales were also placed along the sides of the area to be excavated to divert surface water. As a result NaI 2x2 readings taken during the walkover of the excavation, the volume of contaminated material removed increased from approximately 122 cu yd to 137 cu yd. Following soil removal, additional walkover surveys were conducted and soil confirmation samples were collected to ensure that contaminated materials had been removed. Once the area had satisfied the ROD cleanup criteria for unrestricted release, it was backfilled with approximately 137 cu yd of clean common fill, graded to the original elevation, and seeded. Per agreement with the MDC, the corrugated plastic pipe was left in place under the road.

3.4 MDC 10 Construction Activities

The remediation of MDC 10 began on January 16, 1998, and was completed by February 7, 1998. The volume of contaminated material removed was consistent with the engineering estimate (74 cu yd). Following the soil removal activities, additional walkover surveys were conducted and soil confirmation samples were collected to ensure that contaminated materials had been removed. Once the area had satisfied the ROD cleanup criteria for unrestricted release, it was backfilled with approximately 74 cu yd of clean common fill and graded to the original elevation.

3.5 Changes Affecting CERCLA Compliance

No changes affecting CERCLA were required during the removal actions in any of the Missouri Department of Conservation vicinity properties.

3.6 Emergency Response Activities

No emergency response activities were required as a result of work conducted and completed within MDC 3, 4, 5, and 10 under work package WP-458. During the work activities, there were no contamination events. Four spills occurred consisting of either motor oil or hydraulic oil. All spills were cleaned up by the subcontractor, and the waste was taken to the Ash Pond area.

3.7 Real Estate License Agreements

Prior to remediation of the Missouri Department of Conservation (MDC) vicinity properties, a real estate license agreement with the MDC was obtained. Real estate license 7-96-0152 was executed between the DOE and the MDC on July 22, 1996. This license granted the DOE permission to access, characterize, and perform remediation of contaminated soil within MDC properties MDC 3, MDC 4, MDC 5, and MDC 10. The license will expire on July 22, 2001.

4. POST-REMEDIATION SAMPLING RESULTS

For confirmation purposes, the Missouri Department of Conservation (MDC) vicinity properties were designated as Remedial Unit 14 (RU 14). Each vicinity property was assigned a separate and distinct confirmation unit (CU) number. Confirmation units are approximately 2,000 m^2 and are the basis of confirmation per the *Chemical Plant Area Cleanup Attainment Confirmation Plan* (Ref. 7). In the case of the MDC vicinity properties, most of the CUs were smaller than 2,000 m^2. These smaller CUs were confirmed in the same manner; however, the confirmation was conservative since it reduced the area over which the average concentration was calculated. Table 4-1 summarizes the MDC vicinity properties and the properties' respective confirmation unit designations.

Table 4-1 Summary of MDC Vicinity Property Confirmation Units for RU014

Army Vicinity Property	CU Designation	Area (m^2)	Minimum Number of Samples Required	Actual Number of Samples
MDC 3	CU 166	8.6	4	4
MDC4	CU 167	343.9	5	5
MDC 5	CU 168	131.4	5	5
MDC 10	CU 169	93.0	5	5

After each entire CU was determined to be less than 1.5 times the background gamma radioactivity level, confirmation sampling locations were surveyed and identified with pin flags. Sample locations were selected by superimposing a 10 m grid across the work zone. All grid line intersections (nodes) and some center points lying within the area targeted for soil removal were selected for sampling. In some instances, confirmation areas were smaller than the 10-m grid; therefore at least one sample location was assigned. Narrow drainages that were less than 10 m wide had sample locations assigned every 10 m along the drainage. Soil samples were then collected in accordance with the *Confirmation Sampling Plan Details for Vicinity Properties DA 1, DA 2, DA 3, DA 5, MDC 3, MDC4, and MDC 5 (WP-458)* (Ref. 8) and Addendum 1, MDC 10, of this same plan (Ref. 9). Confirmation sampling at each sample location was performed by collecting soil from the remediation cut surface to a depth of 6 in. for laboratory analysis. Confirmation results and additional specific confirmation information are detailed in the *Post-Remedial Action Report for Vicinity Properties (WP-458)* (Ref. 10).

4.1 MDC 3 Cleanup Confirmation

Based on the sampling results of the Oak Ridge Associated Universities (ORAU) survey, the Project Management Contractor (PMC) remedial investigation for the chemical plant area, and the PMC engineering characterization activity, the contaminants of concern within MDC 3 selected for confirmation purposes were Th-230, U-238, arsenic, chromium, lead, thallium, PCBs, PAHs, and TNT. Prior characterization activities had shown all other radiological

parameters were less than ALARA goals. Sample locations for this confirmation unit (CU 166) are detailed in Figure 4-1.

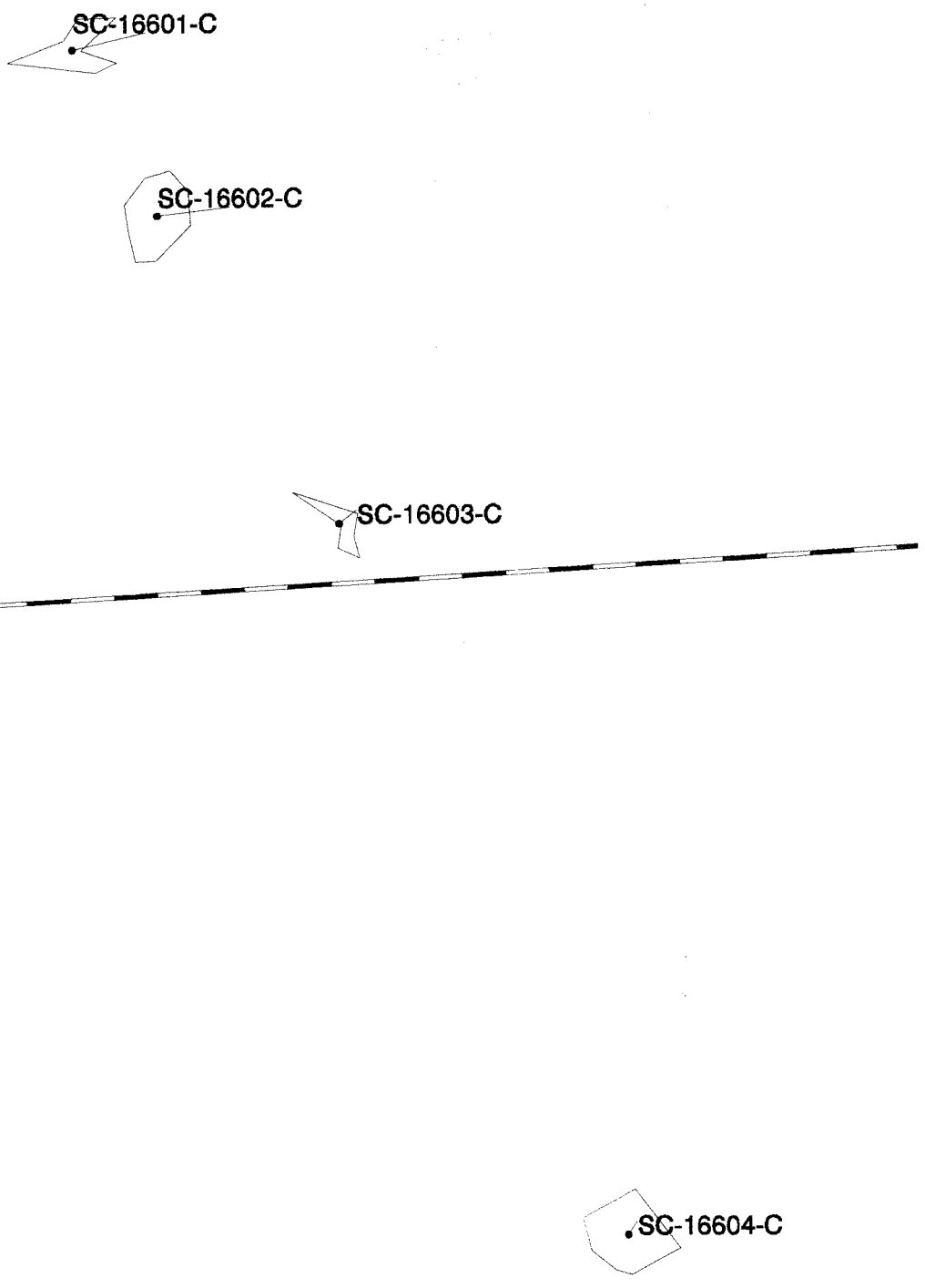
The first criterion for unrestricted release of vicinity properties is whether the average parameter concentration for all sample points within the confirmation unit are below the ALARA goal concentration. The second criterion for unrestricted release is whether any single sample exceeds the parameter cleanup criteria concentration. As summarized in Table 4-2, all average parameter concentrations were below the ALARA goal concentration and no single sample data point exceeded cleanup criteria concentration for any of the parameters. The entire confirmation unit (CU 166) was released for unrestricted use on July 21, 1998.

Table 4-2 Confirmation Unit 166 Analytical Results Summary

Contaminant of Concern	Concentration Range	Concentration Average	Surface ALARA Goal Concentration	Maximum Concentration	Surface Cleanup Criteria	No. of Samples > ALARA
Th-230 (pCi/g)	0.93 – 1.24	1.04	5.0	1.24	6.2	0
U-238 (pCi/g)	1.49 – 12.31	4.42	30.0	12.31	120.0	0
Arsenic (mg/kg)	8.1 – 13.2	10.4	45.0	13.2	75.0	0
Chromium (mg/kg)	15.2 – 34.7	22.77	90.0	34.7	110.0	0
Lead (mg/kg)	14.1 – 158.0	60.92	240.0	158	450.0	0
Thallium (mg/kg)	0.4 – 1.4	0.91	16.0	1.4	20.0	0
PAH's (mg/kg)	All < 0.240	N/A	0.44	< 0.240	5.6	0
PCB's (mg/kg)	All < 0.048	N/A	0.65	< 0.048	8.0	0
TNT (mg/kg)	All < 0.24	N/A	14.0	< 0.24	140.0	0

4.2 MDC 4 Cleanup Confirmation

Prior characterization activities had limited the contaminants of concern for MDC 4 to Ra-226, Th-230, arsenic, chromium, lead, thallium, PAHs, PCBs, and TNT. All other radiological and chemical parameters were less than ALARA goals. A total of five samples were taken at MDC 4 and are illustrated in Figure 4-2. As detailed in Table 4-3, all average concentrations were below their respective ALARA goal concentrations and no single data point exceeded its respective cleanup criteria concentration. The confirmation unit (CU 167) was released for unrestricted use on December 31, 1997.



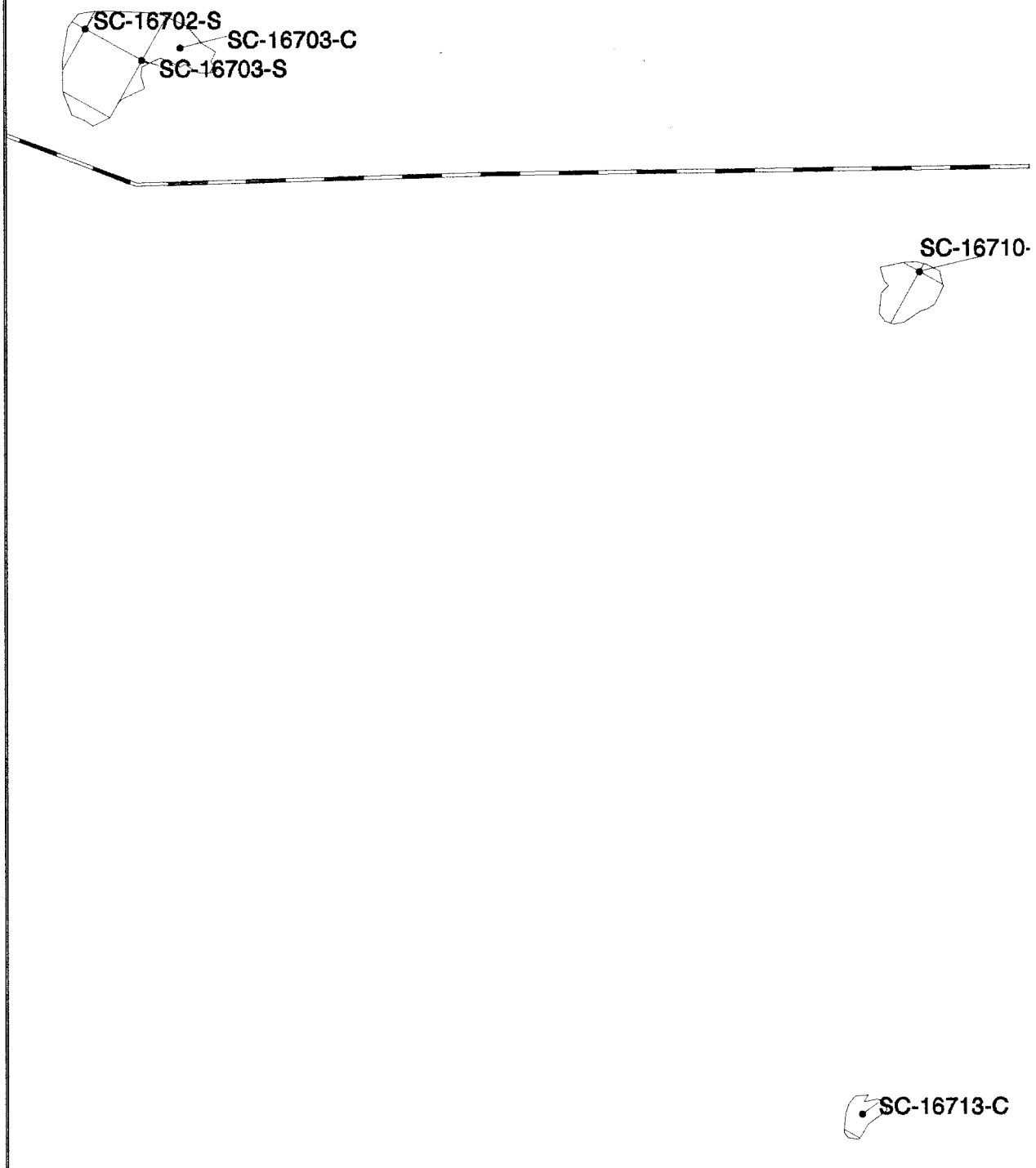
5 2.5 0 METERS

15 7.5 0 FEET

Sample Locations in Remedial Unit RU014
Confirmation Unit CU166

Figure: 4-1

EXHIBIT NO.:	REPORT NO.:	
G/CP/208/0599	DOE/OR/21548-789	
ORIGINATOR: EMR	DRAWN BY: WSSRAP GIS	DATE: 05/10/99



15 7.5 0 METERS

45 22.5 0 FEET

Sample Locations in Remedial Unit RU014
Confirmation Unit CU167

Figure: 4-2

EXHIBIT NO.: G/CP/209/0599		REPORT NO.: DOE/OR/21548-789	
ORIGINATOR: EMR	DRAWN BY: WSSRAP GIS	DATE: 05/10/99	

Table 4-3 Confirmation Unit 167 Analytical Results Summary

Contaminant of Concern	Concentration Range	Concentration Average	Surface ALARA Goal Concentration	Maximum Concentration	Surface Cleanup Criteria	No. of Samples > ALARA
Ra-226 (pCi/g)	1.97 – 2.38	2.23	5.0	2.38	6.2	0
Th-230 (pCi/g)	0.94 – 1.37	1.08	5.0	1.37	6.2	0
Arsenic (mg/kg)	3.50 – 10.90	7.33	45.0	10.90	75.0	0
Chromium (mg/kg)	17.30 – 18.40	17.58	90.0	18.40	110.0	0
Lead (mg/kg)	8.0 – 22.0	15.98	240.0	22.0	450.0	0
Thallium (mg/kg)	0.8 – 4.3	3.49	16.0	4.3	20.0	0
PAHs (mg/kg)	All < 0.110	N/A	0.44	< 0.110	5.6	0
PCBs (mg/kg)	All < 0.038	N/A	0.65	< 0.038	8.0	0
TNT (mg/kg)	0.05 – 0.125	0.166	14.0	0.125	140.0	0

4.3 MDC 5 Cleanup Confirmation

Contaminants of concern targeted within MDC 5 were Ra-226, Ra-228, Th-230, chromium, lead, PAHs, PCBs, and TNT. All other radiological and chemical parameters were less than ALARA goals. A total of five samples were taken of the vicinity property with sample locations detailed in Figure 4-3. As shown in Table 4-4, the average concentrations for each parameter were below their respective ALARA goal concentrations. Also, no single data point exceeded its respective cleanup criteria concentration. The confirmation unit (CU 168) was released for unrestricted use on July 21, 1998.

Table 4-4 Confirmation Unit 168 Analytical Results Summary

Contaminant of Concern	Concentration Range	Concentration Average	Surface ALARA Goal Concentration	Maximum Concentration	Surface Cleanup Criteria	No. of Samples > ALARA
Ra-226 (pCi/g)	2.16 – 2.91	2.58	5.0	2.91	6.2	0
Ra-228 (pCi/g)	1.04 – 1.39	1.17	5.0	1.39	6.2	0
Th-230 (pCi/g)	1.03 – 4.04	2.27	5.0	4.04	6.2	0
Chromium (mg/kg)	17.9 – 24.9	20.76	90.0	24.9	110.0	0
Lead (mg/kg)	11.5 – 64.7	36.12	240.0	64.7	450.0	0
PAHs (mg/kg)	All < 0.244	N/A	0.44	< 0.244	5.6	0
PCBs (mg/kg)	All < 0.052	N/A	0.65	< 0.052	8.0	0
TNT (mg/kg)	All < 0.24	N/A	14.0	< 0.24	140.0	0

4.4 MDC 10 Cleanup Confirmation

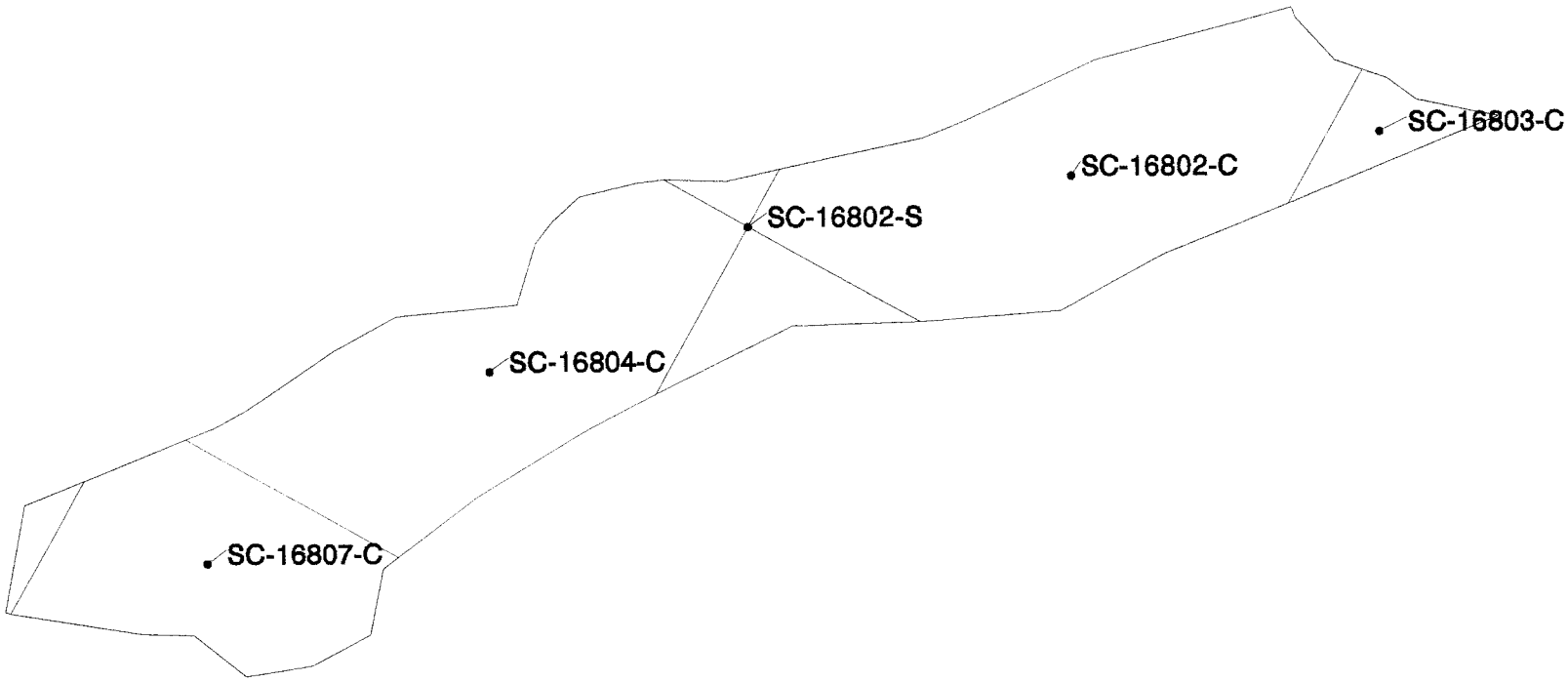
Based upon previous characterizations, the contaminants of concern within MDC 10 selected for confirmation purposes were Ra-226, Ra-228, Th-230, arsenic, chromium, lead, thallium, PAHs, PCBs, and TNT. Prior characterizations had shown U-238 to be less than ALARA goals. A total of five samples were taken of the vicinity property and the sample locations are detailed in Figure 4-4. As summarized in Table 4-5, all average parameter concentrations were below the ALARA goal concentration and no single sample data point exceeded ROD cleanup criteria levels. The confirmation unit (CU 169) was released for unrestricted use on February 20, 1998.

Table 4-5 Confirmation Unit 169 Analytical Results Summary

Contaminant of Concern	Concentration Range	Concentration Average	Surface ALARA Goal Concentration	Maximum Concentration	Surface Cleanup Criteria	No. of Samples > ALARA
Ra-226 (pCi/g)	2.16 – 2.61	2.41	5.0	2.61	6.2	0
Ra-228 (pCi/g)	0.54 – 1.30	1.06	5.0	1.30	6.2	0
Th-230 (pCi/g)	1.26 – 1.74	1.49	5.0	1.74	6.2	0
Arsenic (mg/kg)	7.60 – 13.20	9.96	45.0	13.20	75.0	0
Chromium (mg/kg)	9.60 – 24.60	18.82	90.0	24.60	110.0	0
Lead (mg/kg)	11.20 – 18.40	15.24	240.0	18.40	450.0	0
Thallium (mg/kg)	0.76 – 1.60	1.29	16.0	1.60	20.0	0
PAH's (mg/kg)	All < 0.048	N/A	0.44	< 0.048	5.6	0
PCB's (mg/kg)	All < 0.045	N/A	0.65	< 0.045	8.0	0
TNT (mg/kg)	0.01 – 0.07	0.03	14.0	0.07	140.0	0

4.5 Quality Assurance/Quality Control Results

Specific data quality requirements (DQRs) were developed for the Weldon Spring Site Remedial Action Project (WSSRAP) in accordance with the Environmental Protection Agency guidance for the unrestricted release of vicinity properties. Quality control sample results were



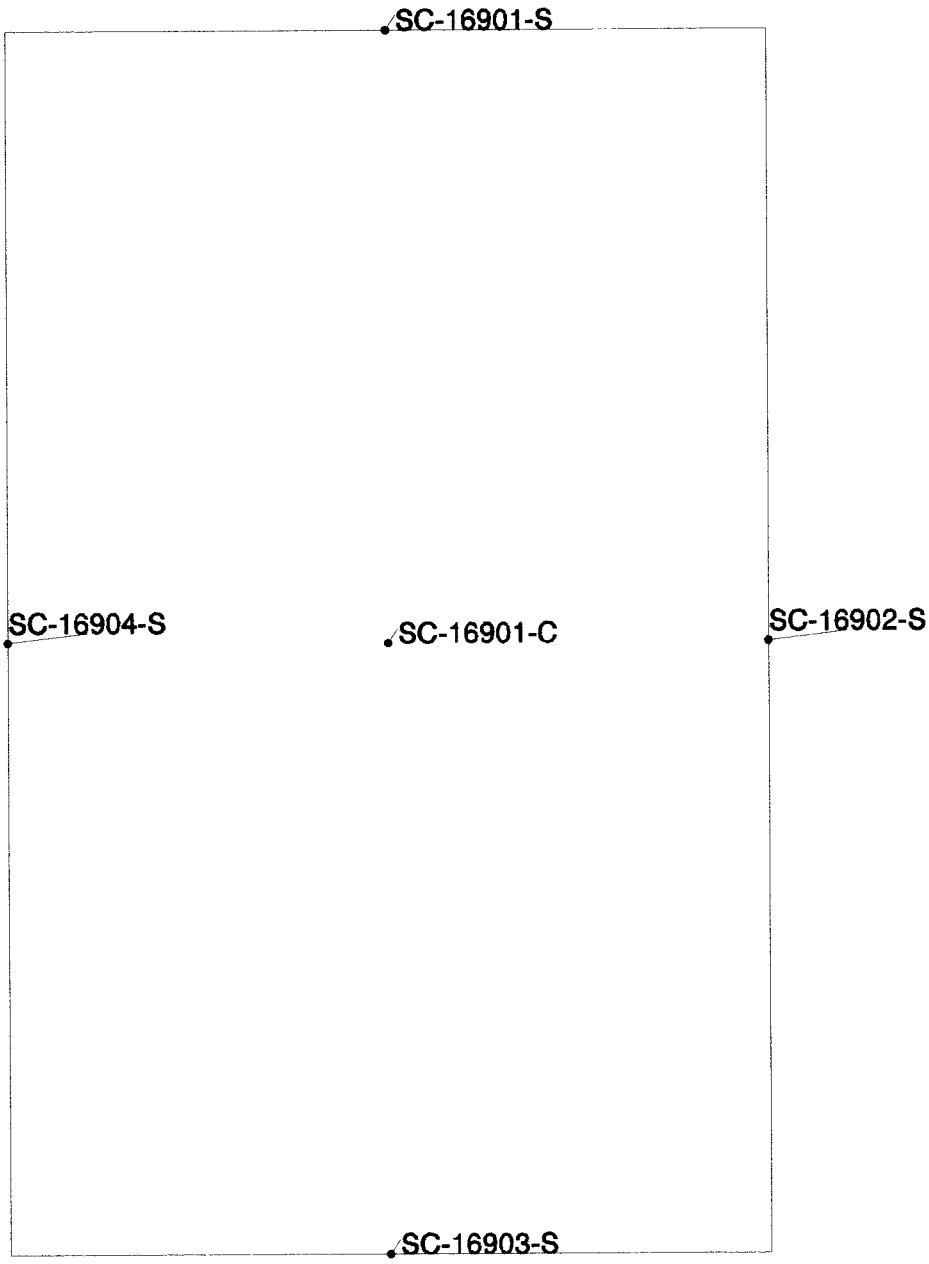
15 7.5 0 METERS

45 22.5 0 FEET

Sample Locations in Remedial Unit RU014
Confirmation Unit CU168

Figure: 4-3

EXHIBIT NO.:	G/CP/210/0599	REPORT NO.:	DOE/OR/21548-789		
ORIGINATOR:	EMR	DRAWN BY:	WSSRAP GIS	DATE:	05/10/99



3 1.5 0 METERS

10 5 0 FEET

Sample Locations in Remedial Unit RU014
Confirmation Unit CU169

Figure: 4-4

EXHIBIT NO.: G/CP/211/0599		REPORT NO.: DOE/OR/21548-789	
ORIGINATOR: EMR	DRAWN BY: WSSRAP GIS	DATE: 05/10/99	

compared to DQR goals to assess the precision and accuracy of the data and to identify samples that might require further validation activities. To assess the precision of the MDC vicinity property data sets, two duplicate samples, two secondary duplicate samples, and two field replicates were taken. Precision is a measurement, expressed as a percentage, which represents the repeatability of the result by the analytical system. This measurement is based on the relative percent differences between laboratory duplicates and their respective parent analysis. Zero percent difference is the best precision. All precision-related samples satisfied the DQR precision goals.

To assess the accuracy of the MDC vicinity property data sets, two matrix spike samples and two matrix spike duplicate samples were taken. Accuracy is a statistical measurement, expressed as a percentage, which represents how close the analytical data are to the "true" value. Matrix spike and matrix spike duplicate samples are intralaboratory splits of a single sample that receive identical spike concentrations of the target analyte and are used to document the accuracy and bias of a method in a given sample matrix. All accuracy-related samples satisfied the DQR precision goals.

Two equipment blanks were sent for off-site analysis to confirm that no cross contamination had occurred in the confirmation sampling activity. The cross contamination would result from either field and/or laboratory procedures. No contamination was detected in either of the two samples. Therefore, the reported data was viewed as representative of the media sampled.

4.6 Oak Ridge Institute for Science and Education Verification

The Oak Ridge Institute for Science and Education (ORISE) was contracted by the DOE to audit the confirmation soil sampling in the chemical plant area and vicinity properties of the Weldon Spring site. ORISE conducted verification surveys at the MDC vicinity properties from January through June of 1997. The surveys were conducted within most of the confirmation units of WP-458. They consisted of walkover radiological surveys and independent collection and analysis of soil samples to verify proper disposition of the CUs. The surveys and sampling were conducted in accordance with ORISE's *Final Verification Survey Plan for the Chemical Plant Area* (Ref. 11). A letter report verifying the PMC's findings that remedial action objectives for the MDC vicinity properties were met is currently under draft and will be transmitted to the PMC upon completion by ORISE.

5. OPERATIONS AND MAINTENANCE

5.1 Long-term Monitoring

No long-term monitoring is planned for the soils within the MDC vicinity properties. The soil radiological concentrations within all areas satisfy the established criteria for unrestricted use.

5.2 Facilities and Equipment

No facilities or permanent equipment were constructed or installed as part of this remedial action. No long-term operations or maintenance activities are necessary.

6. REFERENCES

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3. MK-Ferguson Company and Jacobs Engineering Group. *Record of Decision for Remedial Action at the Chemical Plant Area of the Weldon Spring Site.* Rev. O. DOE/OR/21548-376. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. September 1993.

4. MK-Ferguson Company and Jacobs Engineering Group. *Remedial Investigation for the Chemical Plant Area of the Weldon Spring Site.* Rev. 0. 2 Vols. DOE/OR/21548-074. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. November 1992.

5. MK-Ferguson Company and Jacobs Engineering Group. *Characterization Report IRA #5 August A. Busch and Weldon Spring Wildlife Area Vicinity Properties 3, 4, 5, and 8.* Rev. 0. DOE/OR/21548-022. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. May 1988.

6. MK-Ferguson Company and Jacobs Engineering Group. *Engineering Soils Sampling Plan for Army and MDC Vicinity Properties.* Rev. 0. DOE/OR/21548-622. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. October 1996.

7. MK-Ferguson Company and Jacobs Engineering Group. *Chemical Plant Area Cleanup Attainment Confirmation Plan.* Rev. 3. DOE/OR/21548-491. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. December 1995.

8. MK-Ferguson Company and Jacobs Engineering Group. *Confirmation Sampling Plan Details for Vicinity Properties DA 1, DA 2, DA 3, DA 5, MDC 3, MDC 4, and MDC 5 (WP-458).* Rev. 0. DOE/OR/21548-693. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. September 1997.

9. MK-Ferguson Company and Jacobs Engineering Group. *Confirmation Sampling Plan Details for Vicinity Properties DA 1, DA 2, DA 3, DA 5, MDC 3, MDC 4, and MDC 5 (WP-458) Addendum 1 – MDC 10.* Rev. 0. DOE/OR/21548-693-AD1. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. December 1997.

10. MK-Ferguson Company and Jacobs Engineering Group. *Post-Remedial Action Report for Vicinity Properties (WP-458).* Rev. 0. DOE/OR/21548-767. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. June 1999.

11. Oak Ridge Institute for Science and Education, Environmental Survey and Site Assessment Program, Energy/Environmental Systems Division. *Final Verification Survey Plan for the Chemical Plant Area, Weldon Spring Site Remedial Action Project, Weldon Spring, Missouri.* Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. December 1995.

MK-Ferguson Company
Weldon Spring Site Remedial Action Project

TRANSMITTAL OF CONTRACT DELIVERABLE

Date: **July 1, 1999** Transmittal No.: **CD-0201-01**

Title of Document: **Dloseout Report For Vicinity Properties MDC 3, MDC 4, MDC 5, And MDC 10**

Doc. Num.: **789** Rev. No.: **1** Date of Document: **June 1999**

Purpose of Transmittal: Request for Department of Energy acceptance of contract deliverable.

In compliance with the Project Management Contract, MK-Ferguson Company hereby delivers the attached document to the U.S. Department of Energy, Weldon Spring Site Office. The document has been reviewed and approved by Project Management Contractor management.

The document will be considered accepted unless we receive written notification to the contrary within 30 days of the date of this transmittal.

Number of copies transmitted: **2**

Douglas E. Steffen
Project Director